

REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Allowed claims

Applicants express their appreciation for the allowance of claims 4-7 and 10-14.

Rejection under 35 USC § 103

Claims 1-3, 8 and 9 stand rejected under 35 USC § 103 as being obvious from Mandelman et al. U.S. Patent Publication No. 2002/0085434 in view of Mandelman et al. U.S. Patent No. 6,440,872 further in view of Benedict et al. U.S. Patent No. 6,046,487 further in view of Mandelman et al. U.S. Patent No. 6,284,593. Applicants respectfully traverse this rejection.

Claim 1 of the present invention defines an integrated circuit device having a nitride liner adjacent the isolation regions that extend below the gate conductor on either side of a dynamic random access memory (DRAM) cell. The claim recites that the nitride liner extends to the oxide trench collar of the storage capacitor of the DRAM cell, which is below the strap diffusion region adjacent the capacitor.

The Examiner has cited as the base reference the Mandelman '434 patent publication. Mandelman '434 (for which one of the inventors is also a co-inventor of the present invention) discloses a memory cell structure in which "[s]hallow trench isolation regions extend along a surface of the substrate in a direction transverse to the sidewall

where the vertical transistor extends." Mandelman '434, para. 0003. However, there is no disclosure of how deep these shallow trench isolation (STI) regions extend, and, in particular, whether they extend below the DRAM cell gate or to the trench collar of the storage capacitor. The Examiner acknowledges this lack of disclosure or suggestion in the statement "Mandelman et al. (2002/0085434) fail to disclose the required liner in the required configuration, required liner composition and strap diffusion region." Office action, p.2.

In combination with Mandelman '434, the Examiner has cited the Mandelman '872 patent, which discloses a hybrid memory cell array, taking the position that "Mandelman et al. (6,440,872) disclose a method for a hybrid DRAM cell utilizing confined strap isolation where in Fig. 7B, layers 30 and 42 are the SiN liner." Office Action, p.2. Mandelman '872 states "[i]n accordance with the present invention, each shallow isolation trench region has a depth that is substantially above the one-sided buried-strap outdiffusion region thereby not cutting into the one-sided buried-strap outdiffusion region, yet being deep enough to isolation adjacent bitline diffusion regions that abut each vertical memory cell." Mandelman '872, col. 4, lines 29-36. The Examiner also cites Benedict for the disclosure of a nitride compound liner for shallow trench isolation. However, Benedict does not disclose the use of its STI with a DRAM cell.

The Examiner then takes the position that "Mandelman et al. '593 disclose a method for shallow trench isolated contact well vertical MOSFET DRAM where in Fig. 3B, N+ diffusion strap regions are disclosed." While this may be true, there is again no

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disclosure of any nitride liner extending below the strap diffusion region. Fig. 3B of Mandelman '593 shows no nitride liner at all.

Thus, the cited art in combination simply does not disclose applicants' disclosed embodiment where the nitride STI liner adjacent a DRAM cell extends below the gate conductor to the oxide trench collar of the DRAM cell storage capacitor, below the strap diffusion region. The Benedict and Mandelman '434 and '593 references make no disclosure of the extension of a nitride STI liner to this extent, and the Mandelman '872 reference teaches that the shallow isolation trench depth that is substantially above the one-sided buried-strap outdiffusion region. Accordingly, applicants submit that the instant invention as defined by claim 1 is not obvious from the cited prior art. The remaining rejected claims, nos. 2, 3, 8 and 9, are all dependent on claim 1 and are therefore also not obvious.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



Peter W. Peterson
Reg. No. 31,867

DeLIO & PETERSON, LLC
121 Whitney Avenue
New Haven, CT 06510-1241
(203) 787-0595
lbmf100406000amdB.doc